DOCUMENT RESUME

ED 317 403 SE 051 318

AUTHOR Okebukola, Peter Akinsola; Jegede, Olugbemiro J.
TITLE Survey of Factors that Stress Science Teachers and an Examination of Coping Strategies.
PUB DATE 90
NOTE 17p.; Paper presented at the Annual Meeting of the National Association for Research in Science Teaching (63rd, Atlanta, GA, April 8-11, 1990).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Coping; Foreign Countries; Science Education; *Science Teachers; Secondary Education; Secondary School Science; Sex Differences; *Stress Management; *Stress Variables; *Teaching Conditions
IDENTIFIERS *Nigeria

ABSTRACT

Science teacher stress is a topic that has attracted only a few studies in recent years. The itemized scores of 206 respondents to the 40-item Science Teacher Stress Inventory were pooled and ranked. The top six stressors were found in descending order: (1) Difficulty in obtaining equipment and materials for teaching science effectively; (2) Having to cope with teaching traditionally difficult topics; (3) Inability to complete the syllabus on time; (4) Having to teach subjects like general science or integrated science for which they were not trained; (5) Having to cope with the demands of new curricula; and (6) Poor attitude of students toward science lessons. A large proportion of the teachers coped by engaging in positive thinking about the important role of the science teacher, making determined attempts at improvisation, maintaining a healthy attitude toward stress ul situations, and sharing ideas and laboratory equipment with colleagues. The differences in stress levels between gender, teaching experience, and subject taught are reported. Some implications for science teaching are discussed. (Author/YP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED317403

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Peter Akinsola Okebukola
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Survey of Factors that Stress Science Teachers and an Examination of Coping Strategies

Peter Akinsola OKEBUKOLA
Department of Curriculum Studies
Lagos State University
LAGOS. NIGERIA

and

Olugbemiro J. JEGEDE*
Science Education Section
Ahmadu Bello University,
ZARIA. NIGERIA.

* currently on a Visiting Fellowship at SMEC, Curtin University of Technology, Perth, Western Australia

A Paper Presented at the 63rd Annual Meeting of the National Association for Research in Science Teaching (NARST). Atlanta, GA, USA. 8-11 April, 1990.

SE051 318

Survey of Factors that Stress Science Teachers and an Examination of Coping Strategies

---

ABSTRACT

Science teacher stress is a topic that has attracted only a few studies in recent years (Kyriacou, 1987). Since teaching conditions are not getting any better, it is becoming increasingly evident that science teachers will be exposed to a great deal more stress in the years to come. What are those conditions or situations that stress science teachers? How can the teachers cope with these stressors so that productivity does not take a dip? These are important questions that merit attention at this time. Using a 40-item Science Teacher Stress Inventory (STSI), the opinion of 206 Nigerian science teachers were sought on factors relating to (i) Student characteristics, (ii) Teacher characteristics, (iii) School environment characteristics, (iv) Administrative procedures, and (v) Conditions of service. When the data were pooled and ranked, it was found that Difficulty in obtaining equipment and materials for teaching science effectively, and Having to teach traditionally difficult science topics topped the list of stressors for Nigerian science teachers. Among the strategies teachers adopt for coping with the stressful conditions are: More frequent undertaking of field trips to release class tension; Sharing of ideas and laboratory equipment with colleagues and Positive thinking about the important role science teachers play in nation building. The great demands being made on science teachers as a result of the continuing emphasis placed on science and technology world-wide necessitate that this line of inquiry be included on the research agenda in science education.

Introduction and the Problem

In 1983, science educators and researchers were enjoined to spend a great deal more of research time on identifying and describing 'exemplary' science teaching and programs (Penick & Yager, 19830. This call and the NSTA instituted 'Search for Excellence in Science' were responded to by the conduct of studies especially in the United States (e.g. Yager, 1986; Micik, 1986; Dudley, 1986; Linas, 1986), and Australia through the Exemplary Practice in Science & Mathematics Education (Epsme) Project (Tobin & Fraser, 1987; Garnett & Tobin, 1988). Exemplary programs in these studies, were found to exhibit such characteristics as vision, focus on personal needs, societal issues and career awareness (Shymansky & Kyle, 1988). Exemplary science teachers were shown to ask appropriate questions; respond to questions; use effective cognitive monitoring strategies; possess adequate content knowledge and pedagogical content knowledge (Garnett & Tobin, 1988). These teachers were also found to be committed, prepared and professionally involved (Linas, 1986).

A major intention of the exemplary science teaching projects is to provide models for 'non-exemplary' science teachers to follow. Are the conditions right for such emulations? What resources and support are needed to achieve excellence? Is the science teacher provided the wherewithal to achieve excellence in teaching? What role does the science teacher play in programs dubbed 'excellent'? These however are the questions that science educators are now asking (Shymansky & Kyle, 1988).

Of direct relevance to these questions is the issue of teacher stress. If the science teacher is subjected to stress especially within the work environment, program execution, regardless of being exemplary, is hindered. This line of argument underscores the need to consider the issue of exemplary programs and science teaching side-by-side with conditions such as teacher stress, that can promote or hinder the development of such programs and the display of exemplary science teaching. This paper broadly addresses this issue.

Although the literature on the general issue of teacher stress has grown tremendously within the last ten years (Kyriacou, 1987; 1989), science teacher stress is a topic that has attracted only a few studies. Because teaching conditions are not getting any better, it has been predicted that science teachers will be exposed to a great deal more stress in the years to come (Okebukola & Jegede, 1989; Jegede & Okebukola, 1990). What are those conditions or situations that stress science

teachers? How can teachers cope with these stressors so that productivity does not take a dip? These are important questions that merit attention at this time.

Stress is a condition of mental and physical exertion brought about as a result of harassing events or dissatisfying elements in the environment (Okebukola & Jegede, 1989). On a specific note, teacher stress has been defined by Kyriacou (1989) as the experience by teachers of unpleasant, negative emotions, such as tension, anxiety, frustration, anger and depression, resulting from aspects of work as teachers. Stress leads to the lowering of on-the-job performance - a situation that cannot be tolerated in these days when ways are being sought to improve the quality of teaching in our schools.

Research on teacher stress indicates that the perception of threat comprises two main stages (Kyriacou, 1989). Stage 1 is when the job demands are perceived by the teacher to be difficult or impossible to meet satisfactorily. Stage 2 is when failure to meet these job demands satisfactorily is perceived by the teacher to be a threat to his or her self-esteem or general well-being.

The most frequently cited sources of stress for teachers generally are: poor working conditions (Rowsey and Ley, 1986; Okebukola and Jegede, 1989); misbehaviour of students (Dunham, 1984); lack of resources for teaching (Smilansky, 1984); overload with non-teaching duties (Payne and Furnham, 1987); and students' poor attitude toward work (Kyriacou, 1987). Little or no efforts have been directed at identifying factors that stress science teachers in particular. We would want to believe however that science teachers operate in situations that are unique such as the use of the laboratory; the use of inquiry-teaching method, students' fear of scientific subject matter because of its supposedly difficult nature and health-related hazards associated with working with chemical substances. These situations ar likely to bring about stress to science teachers in particular. The identification of such stress factors is one of the primary purposes of this study.

Identifying the factors that stress science teachers ought not to be the ultimate aim of a study of this nature. The logical corollary should be a quest for ways of assisting science teachers to cope with such stressors. This is the other direction to which attention was turned. The specific questions to which answers were sought in the study are:

(1) What factors do science teachers perceive as capable of bringing stress to bear on them as a result of their being engaged in science teaching thereby inhibiting science teaching effectiveness?

(2) What factors (i) bring the most stress to bear, and (ii) bring the least stress to bear on science teachers?

(3) How do (i) male and female; (ii) experienced and inexperienced; (iii) biology, chemistry and physics teachers compare in their perception of stress?

(4) What strategies do science teachers adopt in coping with stress associated with the teaching of science?

Design and Procedures

Factors which stress science teachers and how teachers cope with such stressors were surveyed in the study. The instrument for data collection was developed in three phases. First, a group of science teachers (N=150) attending a national workshop was asked to list all possible situations and events that bring stress to bear on them as science teachers. This list was harmonised with the statements on the 31-item Occupational Stress Inventory for Teachers (Okebukola and Jegede, 1989) which focus on teachers generally. A 42-item instrument was then developed.

Secondly, the 42-item instrument was construct validated by a panel of five science teachers and three science educators. Two items were dropped at this stage. Lastly, factorial validity was established by factor analysis which came up with five distinguishable factors. The nature of the items loading highest on each of the extracted factors led to the labelling of the factors as (1) Student characteristics, (2) Teacher characteristics, (3) School environment characteristics, (4) Administrative procedures, and (5) Conditions of service. The resulting instrument called the Science Teacher Stress Inventory (STSI) has three sections. Section A seeks demographic data; Section B contains the list of the 40 possible stressors on a 3-point scale: Extreme stress, Mild stress, No stress; Section C asks for open-ended views on how the stressors are coped with. STSI has a stability coefficient of 0.79 (two weeks interval between administrations) and a Cronbach alpha of .91 for section B.

Copies of STSI were distributed to science teachers (N=506) attending an Annual Conference of the Science Teachers Association of Nigeria. 206 completed questionnaires were finally returned.

Section B of STSI was scored 2,1,0 for Extreme stress, Mild stress and No stress respectively for positively-stated items. This scoring mode was reversed for negatively-stated items.

Treatment of Data and Findings

The first task addressed in this study was to identify the factors which science teachers perceive as capable of bringing stress to bear on them. This was accomplished following the development of the Science Teacher Stress Inventory. Forty possible stressors which are listed in Table 1 were identified.

The second research question of the study focussed on identifying the factors which bring the most and the least stress to bear on science teachers. Data in respect of this question were generated as follows: First, the score for each respondent for each of the possible stressors was determined as 0.1, or 2. Secondly, the mean score of all the 206 respondents for each possible stressor was calculated. Thirdly, the mean scores were then rank ordered. This provided information on the first- to the fortieth-ranked stressor (see Table I).

Table I here

The data in Table I were extracted to produce a list of the top ten stressors and the five least stressors. The result of this exercise is shown in Table II.

Table II here

Table II shows that the science teachers in the sample regard difficulty in obtaining science teaching equipment as the most stressful factor. Second to fifth in rank are: Having to cope with teaching difficult topics; Difficulty in completing the syllabus in the time available; Having to teach a science subject one is not trained for; and Having to cope with the demands of new curricula.

Stressing science teachers the least were the following: Having to cope with non-teaching delegated duties; Principal's reluctance to deal with difficult parents; Unattractive salary; Delay in promotion; and Pace of the school day is too fast.

This study also sought to compare the degree of stress on different groups of teachers. A total stress score was computed for each respondent as the sum of scores for each of the forty possible stressors. A score range of 0 - 80 was obtained. The

mean scores for each level in the three groups of interest: Sex of the teacher (male, female); teaching experience (inexperienced i.e. less than 5 years post-qualification teaching experience; experienced i.e. 5 years post-qualification teaching experience and above); and subject taught (biology, chemistry and physics) were compared using t- or F-tests as appropriate. The results are reported in Table III.

Table III here

Table III reveals that female teachers were significantly more stressed than male teachers; inexperienced teachers were significantly more stressed than their experienced counterparts and chemistry teachers perceived the most stress in comparison with biology and physics teachers.

In addressing the issue of coping with stress, the free responses of the science teachers were clustered around eight major ideas. The percentages of the science teachers in the sample who listed coping strategies classifiable into each of these major ideas are reported in Table IV

Table IV here

Table IV shows that a good proportion of the teachers cope by engaging in positive thinking; making more determined attempts at improvising apparatus; and maintaining a care-free attitude to stressful situations. Few cope by engaging in other revenue-generating ventures outside teaching to make more money; and undertake field trips to release class tension.

Discussion and Conclusion

The first major issue in this study was to find out those factors which inhibit science teaching effectiveness by bringing stress to bear on science teachers. Data from our survey indicate that five clusters of factors are implicated. These are: Student characteristics such as "Poor attitude of students to science lessons"; Teacher characteristics e.g. "Having to teach a science subject one is not trained for"; School environment characteristics like "Difficulty in obtaining science teaching equipment"; Administrative procedure e.g. "Inadequate disciplinary policy of the school"; and Conditions of service such as "Lack of opportunities for professional improvement".

The clusters of stressors extracted in this study by principal component factoring with varimax rotation, agrees in large part with those reported in the literature e.g. Payne & Furnham (1987), Okebukola & Jegede (1989). A new insight added by the present study is the identification of Administrative procedures and School environment characteristics as two groups or clusters of stressors which hithertofore were collapsed as one. Another major contribution is the identification of factors which stress science teachers in particular (see stressors listed in Table I as Nos 1, 3, 4, 5, 9, 111, 15, 19, 20, 21, 25, and 26). The reported research on teacher stress unfortunately does not give prominency to these possible stressors.

Attention should be focussed next on factors which stress science teachers the most. We found in this study (see Table II) that the difficulty in obtaining science teaching equipment was the most stressful factor. Since science teachers know that they are engaged in teaching an experimental subject, non-availability of lab equipment and materials could be seen as a major handicap to successful achievement of science teaching objectives. The frustration that results may be likened to that experienced by a farmer who is confronted with the situation of clearing, harrowing, planting and harvesting crops on a farmland with his bare hands; no farm implements whatsoever!

Difficulty in obtaining science teaching equipment can ultimately lead to students performing poorly in examinations. This could be quite agonizing for the teacher since an index of science teaching effectiveness is how well students perform in examinations. A factor that could be positively associated with students' underachievement has a great potential for stressing teachers. This could be why the factor of "Difficulty in obtaining science teaching equipment" came to be the number 1 stressor for the sample of teachers in the study.

Ranking second is "Having to cope with teaching difficult topics". When a topic is perceived to be difficult to teach and learn, such as genetics, ecology, the mole, energetics and stoichiometry, the science teacher is naturally apprehensive of facing the class to teach the topic. coping with difficult topics entails harder preparation in terms of reading background textual materials, search for teaching aids and exploration of more stimulating methodology. This is an ordeal few teachers want to face. Little wonder science teachers consider the factor of teaching difficult topics quite stressful.

"Difficulty in completing the syllabus in the time available" ranked third on the list of top ten stressors (Table 2). The rush to achieve syllabus requirements is particularly acute with externally-conducted examinations. The examining body sets

a common examination for all schools within the framework of the entire syllabus content. As a result of poor time and resource management, or other constraints, the teacher is faced with the onerous task of having to cover a whole year's work in a few weeks. This could be highly intimidating for the teacher, thereby bringing stress to bear on him or her.

Two other stressors are worthy of mention among the top ten category. These are: "Having to cope with the demands of new curricula" and "Having to teach large classes". The former has implication for successful teaching on exemplary science programs. The latter is a vexed issue in many Third World countries (see Okebukola, 1987).

The issue of inadequate salary showed up on the list of five least stressors. This is not in accord with the findings of Hendrix & Mertens (1986) who found higher pay to be one of the top three ways of attracting and retaining qualified science teachers.

These findings are far from being consonant with those of previous studies which focussed on teachers generally and found such factors as poor attitude of students to work and lack of opportunities for professional improvement to be top stressors (see Kyriacou, 1987; and Okebukola and Jegede, 1989 for reviews). This translates to mean that science teachers may have situations in the work environment which stress them particularly by virtue of their being involved in the teaching of science. Although the findings of this study do not merit wide generalization,m it is expedient to note that science teachers can be subjected to appreciable stress as a result of exposure to conditions listed in (1) to (5) above, among others.

Further probe into the data obtained in the study showed that male teachers who are married with at least five years post-qualification teaching experience recorded the least total stress score. The maximum total stress score was obtained by inexperienced (less than two years post-qualification teaching) single female teachers.

Among the strategies teachers adopt for coping with the stressful conditions are: More frequent undertaking of field trips to release class tension; sharing of ideas and laboratory equipment with colleagues; positive thinking about the important role of the science teacher in nation building; relaxation and leisure; and more determined attempts at improvisation.

As we approach the third millenium, the society will get more complex and greater demands will be made on the science teacher. It is auspicious at this time to keep track of those factors that can mentally and physically exhaust the science teacher by virtue of being engaged in the science teaching profession. This is why this line of inquiry should be on the research agenda world-wide. It is in fact apt to make science teachers aware of how to cope with these stressors through counselling programmes. With this, the science teacher can keep his/her head high up in the anticipated stressful times of 2000 A.D. and beyond.

REFERENCES

Dudley, E.C. (1986). The children's school of science - A history and analysis (Doctoral dissertation, University of Maryland, 1985). Dissertation Abstract International 47 (2), 488A.

Dunham, J. (1984). Stress in Teaching. London: Croom Helm.

Garnett, P.J. & Tobin, K. (1989). Teaching for understanding: Exemplary practice in high school chemistry. Journal of Research in Science Teaching, 26 (1), 1-14.

Hendrix, J.R. & Mertens, T.R. (1986). Attracting and retaining qualified high school science teachers. The American Biology Teacher 48, 32-36.

Jegede, O.J. & Okebukola, P.A.O. (1990). Sources and ranking of occupational stress factors among Nigerian teachers. Paper prepared for ICET 1990 World Assembly, 27-31 July, Singapore.

Kyriacou, C. (1987). Teacher stress and burnout: an international review. Educational Research, 29, 145-152.

Kyriacou, C. (1989). The nature and sources of stress facing teachers. Paper presented at the 3rd European Conference for Research on Learning and Instruction held at the Universida Autonoma de Madrid, Spain, 4-7 September.

Linas, C.F. (1986). An analysis of eighteen outstanding selected secondary science education programs in the State of Illinois (Doctoral Dissertation, Northern Illinois University, 1986). Dissertation Abstract International, 47 (6), 2105A.

Micik, J.M. (1986). Science Achievement in an American school: A case study (Doctoral Dissertation, Columbia University, 1986). Dissertation Abstracts International, 47 (6), 2105A.

Okebukola, P.A.O. (1987). The problem of large classes in science: An experiment in cooperative learning. European Journal of Science Education, 8(1), 73-77.

Okebukola, P.A.O. & Jegede, O.J. (1989). Determinants of occupational stress among teachers in Nigeria. Educational Studies, 15(1) 23-35.

Payne, M.A. & Furnham, A. (1987). Dimensions of occupational stress in West Indian secondary school teachers. British Journal of Education Psychology, 57, 14-23.

Penick, J.E. & Yager, R.E. (1986). Trends in science education: Some observations of exemplary programs in the United States. European Journal of Science Education, 8, 1-8.

Rowsey, R.E. & Ley, T.C. (1986). Perception of teachers' salaries and non-salary benefits. Journal of Teacher Education, 37, 42-45.

Shymansky, J.A. & Kyle, W.C. (1988). A summary of research in science education. Science Education, 72(3) 254-267.

Smilansky, J. (1984). External and internal correlates of teachers' satisfaction and willingness to report stress. British Journal of Educational Psychology, 54, 84-92.

Tobin, K. & Fraser, B.J. (1987). Exemplary practice in science and mathematics. Perth, Western Australia: Western Australian Institute of Technology.

Yager, R.E. (1986). Searching for excellence. Journal of Research in Science Teaching, 23, 209-217.

TABLE I

Mean Scores and Rank Order of Stress Factors

		Mean	Rank Order
Student characteristics			
1.	Poor attitude of students to science lessons	1.391	6
2.	Unruly and disruptive behavior of students	1.318	7
3.	Breakage of/damage to expensive lab equipment	1.192	20
4.	Poor performance in science examinations	1.187	22
5.	Many science students do not behave like young scientists	1.180	23
6.	Failure of students to do assignments	1.196	19
7.	Students who look blank in science classes	1.200	17
8.	Students not coming to class with necessary materials	1.171	24
Teacher characteristics			
9.	Having to teach a science subject one is not trained for	1.429	4
10.	Having to cope with the demands of new curricula	1.401	5
11.	Fear of getting injured as a result of lab accidents	1.192	20
12.	Lack of interest in teaching as a profession	1.163	25
13.	Difficulty in completing the syllabus in the time available	1.506	3
14.	Having to cope with teaching difficult topics	1.533	2
15.	Having to teach students who are not motivated to learn science	1.286	9
16.	Not enough time to complete lesson preparation and marking	1.151	26
17.	Having to cover lessons for absent teachers	1.143	28
18.	Insufficient time to deal with private matters	1.151	26
School environment			
19.	Difficulty in obtaining science teaching equipment	1.621	1
20.	Lack/inadequacy of laboratory support personnel	1.213	10
21.	No colleagues to consult on science teaching problems	1.126	29
22.	Large science classes	1.318	7
23.	Noise and other disturbances from neighboring classrooms	1.105	30
24.	Lack of classroom space for group work	1.068	31
25.	Non-supportive role of other teachers towards science teaching	1.053	32
26.	School environment not having location for field work	1.002	33
27.	Pace of the school day is too fast	0.801	40
Administrative procedure			
28.	Inadequate disciplinary policy of the school	0.966	34
29.	Having to comply with decisions made without consulting teachers	0.929	35
30.	Having to cope with non-teaching delegated duties	0.801	36
31.	Principal's reluctance to reprimand misbehaving students	1.200	17
32.	Assignment to classes not preferred	1.201	15
33.	Principal's reluctance to deal with difficult parents	0.843	37
34.	Unfavourable school time-table	1.201	15
35.	Having to cope with policies that are not supportive of science teaching	1.206	11
Conditions of Service			
36.	Lack of opportunities for professional improvement	1.206	11
37.	Unattractive salary	0.821	38
38.	Delay in promotion	0.806	39
39.	Lack of opportunity to experiment with new ideas	1.206	11
40.	Lack of incentives and rewards for hard work	1.206	11

TABLE II

Top Ten and Five Least Stressors on Science Teachers in the Sample

---

Top ten stressors (1 = highest; 10 = lowest)

1. Difficulty in obtaining science teaching equipment.
2. Having to cope with the teaching of difficult topics.
3. Difficulty in completing the syllabus in the time available.
4. Having to teach a science subject one is not trained for.
5. Having to cope with the demands of new curricula.
6. Poor attitude of students to science lessons.
7. Unruly and disruptive behaviors of students.
8. Large science classes.
9. Having to teach students who are not motivated to learn science.
10. Lack/inadequacy of laboratory support personnel.

Five least stressors (1 = highest; 10 = lowest)

1. Having to cope with non-teaching delegated duties.
2. Principal's reluctance to deal with difficult parents.
3. Unattractive salary.
4. Delay in promotion.
5. Pace of the school day is too fast.

TABLE III

Means, Standard Deviations and t/F-tests comparing Stress Levels of Different Groups of Teachers

Group	N	Mean	S.D.	t/F
Male	129	43.24	8.99	
Female	77	53.06	8.21	25.23*
Inexperienced	64	51.26	9.21	
Experienced	142	44.89	7.98	20.91*
Biology	99	43.76	7.41	
Chemistry	67	58.41	9.11	16.84*
Physics	40	40.02	6.36	

* $p < .01$

TABLE IV

Percentage of Science Teachers who adopt general Coping Strategies

Coping strategy		N	%
1.	Sharing of ideas and lab equipment with colleagues	179	87
2.	More determined attempts at improvisation	186	91
3.	Positive thinking (The reward of the teacher is in heaven)	190	93
4.	Relaxation and leisure	128	62
5.	Undertaking field trips to release class tension	36	18
6.	Regular student counselling	103	50
7.	Maintaining a care-free posture	186	91
8.	Engagement in revenue-generating ventures outside teaching	29	14